Claims

1. An integrated photonic device comprising:

a substrate;

a photonic circuit etched onto said substrate;

a cladding layer positioned on said substrate, said cladding layer having a refractive index different from said circuit; and

an angled implantation disposed in said cladding layer, said angle implantation optically connecting said photonic circuit with an outer surface of said cladding layer.

2. The integrated photonic device according to claim 1, wherein said substrate comprises an oxide.

3. The integrated photonic device according to claim 1, wherein said cladding layer comprises an oxide.

4. The integrated photonic device according to claim 1, wherein said photonic circuit comprises a waveguide.

5. The integrated photonic device according to claim 4, wherein said waveguide comprises SiON.

6. The integrated photonic device according to claim 1, wherein said angled implantation forms an angle of about 50 degrees with said substrate.

7. The integrated photonic device according to claim 1, wherein said angled implantation forms an angle less than 50 degrees with said substrate.

8. The integrated photonic device according to claim 1, wherein said angled implantation is injected with nitrogen and annealed to form a channel of SiON connecting said photonic circuit with an outer surface of said cladding layer.

9. The integrated photonic device according to claim 1, wherein said photonic circuit has a refractive index of about 1.6 and said substrate has a refractive index of about 1.44.

10. A process to manufacture an integrated photonic device, said photonic device comprising vertically disposed waveguides optically connected by an angled implantation, comprising the steps of:

patterning and etching a photonic waveguide onto a substrate;

putting down a cladding layer over said waveguide and substrate;

coating said cladding layer with a photoresist;

patterning said photoresist with holes, said holes being slightly offset from said waveguide;

implanting nitrogen into said holes;

stripping said photoresist; and

annealing said nitrogen, said annealing activating said nitrogen and forming a SiON angled channel connecting said waveguide with an outer surface of said cladding.

11. The process to manufacture an integrated photonic device according to claim 10, wherein said channel forms an angle of about 50 degrees with said substrate.

12. The process to manufacture an integrated photonic device according to claim 10, wherein said channel forms an angle of less than 50 degrees with said substrate.

13. The process to manufacture an integrated photonic device according to claim 10, wherein said nitrogen is injected into said holes in two or more doses.

14. The process to manufacture an integrated photonic device according to claim 10, further comprising the step of putting down a second waveguide on said outer surface of said cladding, said second waveguide being optically coupled to said channel and said photonic waveguide.

15. An integrated photonic circuit comprising:

a substrate;

a photonic waveguide etched onto said substrate;

a cladding layer vertically disposed on said waveguide and substrate, said cladding layer having a refractive index different from said waveguide; and

means to optically connect said photonic waveguide with an outer surface of said cladding layer.

16. The integrated photonic circuit according to claim 15, wherein said means to connect said photonic waveguide with said outer surface forms an angle of about 50 degrees with said substrate.

17. The integrated photonic circuit according to claim 15, wherein said means to connect said photonic waveguide with said outer surface forms an angle of less than 50 degrees with said substrate.

18. The integrated photonic circuit according to claim 15, wherein said waveguide comprises SiON.

19. The integrated photonic circuit according to claim 15, wherein said waveguide has a refractive index of about 1.6 and said substrate has a refractive index of about 1.4.

20. The integrated photonic circuit according to claim 15, wherein said substrate and said cladding comprise oxide.